

### EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Greg Clements on June 16, 2011. The support for Examiner's amendment is found in original claims as filed and instant specification (see paragraphs [0021], [0024], [0027], [0017]; [0047] of instant specification).

2. The specification is amended as follows:

Insert the following paragraph as the first paragraph after the title:

This application is a 371 National Stage Application of International Application PCT/EP2004/052025, filed Sept. 3, 2004, the disclosure of which is incorporated herein by reference in its entirety.

3. Please, substitute the previously filed Abstract with a new Abstract:

Foamable compositions which are usable for the manufacture of foamed, flexible, heat resistant, thermoplastic elastomeric articles, and which comprise at least: (a) 100 parts by weight of one or more selectively hydrogenated block copolymers, having at least two resinous blocks A of non-hydrogenated predominantly polymerized monovinyl arene, and a selectively hydrogenated elastomeric block B, wherein said block B prior to hydrogenation being predominantly a polymerized conjugated diene or dienes, said block copolymer having a total apparent molecular weight of at least 250 kg/mole, and

containing polymerized monovinyl arene blocks of true molecular weight of at least 18 kg/mole, (b) 5 to 50, preferably from 15 to 40 parts by weight of one or more selectively hydrogenated block copolymers having at least two resinous blocks A' of non-hydrogenated predominantly polymerized monovinyl arene, and an selectively hydrogenated elastomeric block B', wherein said block B' prior to hydrogenation has been derived from a polymerized conjugated diene or dienes as a major component which may be mixed with minor proportions of other copolymers (e.g. vinyl aromatic) i.e. 25 wt%, and said block copolymer having a total apparent molecular weight in the range of from 50,000 to 180,000, while the resinous blocks A' shown an true molecular weight in the range of from 3 to 20 kg/mole and preferably from 5 to 15 kg/mole, (c) from 25 to 80 parts by weight of a linear crystalline polymer comprising propylene as major component, with a Vicat softening temperature in the range of from 130°C to 180°C and a MFR in the range of from 0.5 to 30 dg/min and a polydispersity index of at least 4.5, (d) from 100 to 250 parts by weight of a softener compatible with blocks B and B', (e) from 0.01 to 3 wt%, relative to the weight of the primary components (a) up to (e) of a solid chemical nucleating agent of the endothermic group in combination with a blowing agent, and optionally (f) one or more secondary components selected from PPO and/or any resins compatible with block copolymer component (a), antioxidants, UV stabilizers, flame retardants, surface modifying agents and inorganic fillers and foamed articles derived from said compositions.

The new Abstract:

Foamable compositions which are usable for the manufacture of foamed, flexible, heat resistant, thermoplastic elastomeric articles, and which comprises at least:

- (a) 100 pbw of one or more selectively hydrogenated block copolymers,
- (b) 5 to 50 pbw per 100pbw of component (a) of one or more different selectively hydrogenated block copolymers,
- (c) 42 to 80 pbw per 100 pbw of component (a) of a linear crystalline polymer comprising propylene as the major component,
- (d) from 100 to 250 pbw per 100 pbw of component (a) of a softener compatible with blocks B and B', and
- (e) from 0.01 to 3 wt. %, relative to the weight of the primary components (a) to (e) of a solid chemical nucleating agent of the endothermic group in combination with a blowing agent.

4. Claims are amended as follows:

Claim 15 is cancelled.

Claim 13 is amended as follows:

13. (currently amended) Foamable compositions which are usable for the manufacture of foamed, flexible, heat resistant, thermoplastic elastomeric articles, and which comprise at least:

(a) 100 parts by weight of one or more selectively hydrogenated block copolymers, having at least two resinous blocks A of non-hydrogenated predominantly polymerized monovinyl arene, and a selectively hydrogenated elastomeric block B, wherein said block B prior to hydrogenation being predominantly a polymerized conjugated diene of polybutadiene, said block copolymer having a total apparent molecular weight ~~of at least~~ from 250 - 600 kg/mole, and containing polymerized

monovinyl arene blocks of true molecular weight of from 18 to 60 kg/mole, and said polymerized monovinyl arene content is in the range of from 20 to 35 wt%.

b) 5 to 50 parts by weight per 100 parts by weight of component (a) of one or more selectively hydrogenated block copolymers having at least two resinous blocks A' of non-hydrogenated predominantly polymerized monovinyl arene, and an selectively hydrogenated elastomeric block B', wherein said block B' prior to hydrogenation has been derived from a polymerized conjugated diene or dienes as a major component which may be mixed with minor proportions 25 or less wt% of other copolymers (e.g. vinyl aromatic) i.e. ≤ 25 wt%, and said block copolymer having a total apparent molecular weight in the range of from 50 to 180 kg/mole, while the resinous blocks A' shown an true molecular weight in the range of from 3 to 20 kg/mole,

c) from ~~25~~ 42 to 80 parts by weight per 100 parts by weight of component (a) of a linear

crystalline polymer comprising propylene as major component, with a Vicat softening temperature in the range of from 130°C to 180°C and a MFR in the range of from 0.5 to 30 dg/min and a polydispersity index of at least 4.5,

(d) from 100 to 250 parts by weight per 100 parts by weight of component (a) of a softener compatible with blocks B and B',

(e) from 0.01 to 3 wt%, relative to the weight of the primary components (a) up to (e) of a solid chemical nucleating agent of the endothermic group in combination with a blowing agent, and optionally

(f) one or more secondary components selected from PPO and/or any resins compatible with block copolymer component (a), antioxidants, UV-stabilizers, flame retardants, surface modifying agents and inorganic fillers.

Claim 14 is amended as follows:

14. The foamable compositions of claim 13, which comprise as components (a) and (b) at least one block copolymers of the general formulae



respectively, wherein A, A' and A<sup>+</sup> represent a poly(monovinyl arene) block and B, B' and B<sup>+</sup> represent a hydrogenated poly(conjugated diene(s)) block, wherein n is an integer  $\geq 2$  and wherein X is the remainder of a coupling agent, wherein the blocks A, A' and A<sup>+</sup> are different and the blocks A are larger than the blocks A', which in turn larger than A<sup>+</sup>, while the blocks B and B' are larger than B<sup>+</sup>.

Claim 18 is amended as follows:

18. (currently amended) The foamable compositions of claim 13, wherein component (c) is a single polymer or a mixture of polymers predominantly composed of propylene monomer or a copolymer of predominantly propylene with a minor proportion less than 25 wt% of a different alkylene selected from ethylene or butylenes, i.e. less than 25 wt% of the monomer mixture.

Claim 22 is amended as follows:

22. The foamable compositions of claim 13, wherein component (e) is selected from mixtures of the group consisting of a mixture of NaHCO<sub>3</sub> and with citric acid or a mixture of NaHCO<sub>3</sub> with sodium citrate, or in amounts of from 0.5 to 1 wt%,  
relative to the weight of components (a) up through (e).

Claim 23 is amended as follows:

23. The foamable compositions of claim 14, wherein

i) the block copolymer component (a) has the formula ABA or (AB)<sub>n</sub>X, has a total apparent molecular weight in the range of from 250,000 to 600,000, wherein A represents a substantially pure poly(styrene) block and wherein the poly(styrene) block content in said block copolymer (a) is in the range of from 20 to 35 wt% and wherein B represents a hydrogenated poly(butadiene) block;

ii) the weight ratio between the block copolymer components (a) and (b) is in the range of from 10 to 40 parts by weight of component (b) per 100 parts by weight of component (a);

iii) component (c) is a single polymer or a mixture of polymers predominantly

composed of propylene monomer or ~~copolymer~~ copolymer of predominantly propylene with a minor proportion of a different alkylene selected from ethylene or butylenes, having a melt flow rate in the range of between 2 and 15 dg/min at ~~230°C/2.46~~ 230°C/2.16 kg, a Vicat softening temperature in the range of from 130 to 170°C, and occurs in a weight ratio of from 42 to 65 parts by weight of (c) per 100 parts by weight of (a);

iv) component (d) is a paraffinic oil; and

v) component (e) is selected from mixtures the group consisting of a mixture of

~~NaHCO<sub>3</sub> and~~ with citric acid ~~or~~ and a mixture of NaHCO<sub>3</sub> with sodium citrate, ~~or~~ in amounts of from 0.5 to 1 wt%,

relative to the weight of components (a) up through (e).

Claim 24 is amended as follows:

24. The foamable compositions of claim 14, wherein

i) the block copolymer component (b) has the formula A'B'A' or (A'B')<sub>n</sub>X, has a total apparent molecular weight in the range of from 80 to 160 kg/mole, wherein A' represents a substantially pure poly(styrene) block, each having a molecular weight in the range of from 5 to 15 kg/mole;

ii) the weight ratio between the block copolymer components (a) and (b) is in the range of from 10 to 40 parts by weight of component (b) per 100 parts by weight of component (a);

iii) component (c) is a single polymer or a mixture of polymers predominantly composed of propylene monomer or ~~copolymer~~ copolymer of predominantly propylene with a minor proportion of a different alkylene selected from ethylene or butylenes, having a melt flow rate in the range of between 2 and 15 dg/min at ~~230°C/2.46~~ 230°C/2.16 kg, a Vicat softening

temperature in the range of from 130 to 170°C, and occurs in a weight ratio of from 42 to 65 parts by weight of (c) per 100 parts by weight of (a);

iv) component (d) is a paraffinic oil; and

v) component (e) is selected from ~~mixtures~~ the group consisting of a mixture of

$\text{NaHCO}_3$  ~~and with~~ citric acid ~~or~~ and a mixture of  $\text{NaHCO}_3$  with sodium citrate, ~~or in~~ amounts of from 0.5 to 1 wt%,

relative to the weight of components (a) up through (e).

Claim 25 is amended as follows:

25. (currently amended) Foamed articles comprising

(a) 100 parts by weight of one or more selectively hydrogenated block copolymers, having at least two resinous blocks A of non-hydrogenated predominantly polymerized monovinyl arene, and a selectively hydrogenated elastomeric block B, wherein said block B prior to hydrogenation being predominantly a polymerized conjugated diene of polybutadiene, said block copolymer having a total apparent molecular weight ~~of at least~~ from 250 – 600 kg/mole, and containing polymerized

monovinyl arene blocks of true molecular weight of from 18 to 60 kg/mole, and said polymerized monovinyl arene content is in the range of from 20 to 35 wt%,

b) 5 to 50 parts by weight per 100 parts by weight of component (a) of one or more selectively hydrogenated block copolymers having at least two resinous blocks A' of non-hydrogenated predominantly polymerized monovinyl arene, and an selectively hydrogenated elastomeric block B', wherein said block B' prior to hydrogenation has been derived from a polymerized conjugated diene or dienes as a major component which may be mixed with ~~minor proportions~~ 25 or less wt.% of other copolymers (e.g. vinyl aromatic) i.e. ~~≤ 25 wt%~~, and said block copolymer having a total apparent molecular weight in the range of from 50 to 180 kg/mole, while the resinous blocks A' shown an true molecular weight in the range of from 3 to 20 kg/mole,

c) from ~~26~~ 42 to 80 parts by weight per 100 parts by weight of component (a) of a linear crystalline polymer comprising propylene as major component, with a Vicat softening temperature in the range of from 130°C to 180°C and a MFR in the range of from 0.5 to 30 dg/min and a polydispersity index of at least 4.5,

(d) from 100 to 250 parts by weight per 100 parts by weight of component (a) of a softener compatible with blocks B and B',

(e) from 0.01 to 3 wt%, relative to the weight of the primary components (a) up to (e) of a solid chemical nucleating agent of the endothermic group in combination with a blowing agent, and optionally

(f) one or more secondary components selected from PPO and/or any resins compatible with block copolymer component (a), antioxidants, UV-stabilizers, flame retardants, surface modifying agents and inorganic fillers.

Claim 26 is amended as follows:



26. (currently amended) Pre-blends for the preparation of the foamable compositions ~~of~~ according to claim 13, comprising either:

(A) a pre-blend comprising components (a), (c) and (d) , wherein (a) is one or more selectively hydrogenated block copolymers, having at least two resinous blocks A' of non-hydrogenated predominantly polymerized monovinyl arene, and a selectively hydrogenated elastomeric block B', wherein said block B' prior to hydrogenation being predominantly a polymerized conjugated diene of polybutadiene, said block copolymer having a total apparent molecular weight of at least 250 kg/mole, and containing polymerized monovinyl arene blocks of true molecular weight of at least 18 kg/mole; (c) is a linear crystalline polymer comprising propylene as major component, with a Vicat softening temperature in the range of from 130°C to 180°C and a MFR in the range of from 0.5 to 30 dg/min and a polydispersity index of at least 4.5; and (d) a softener compatible with blocks B and B'; or

(B) a pre-blend comprising components (b), (c) and/or (d) wherein (b) is one or more selectively hydrogenated block copolymers having at least two resinous blocks A' of non-hydrogenated predominantly polymerized monovinyl arene, and an selectively hydrogenated elastomeric block B', wherein said block B' prior to hydrogenation has been derived from a polymerized conjugated diene or dienes as a major component which may be mixed with minor proportions of other copolymers (e.g. vinyl aromatic) i.e. 25 wt%, and said block copolymer having a total apparent molecular weight in the range of from 50 to 180 kg/mole, while the resinous blocks A' shown an true molecular weight in the range of from 3 to 20 kg/mole; (c) is a linear crystalline polymer comprising propylene as major component, with a Vicat softening temperature in the range of from 130°C to 180°C and a MFR in the range of from 0.5 to 30 dg/min and a polydispersity index of at least 4.5; and (d) a softener compatible with blocks B and B'.

5. The claims are renumbered as follows:

Claim 13 becomes claim 1.

Claim 14 becomes claim 2, dependent on claim 1.

Claim 16 becomes claim 3, dependent on claim 2.

Claim 23 becomes claim 4, dependent on claim 2.

Claim 24 becomes claim 5, dependent on claim 2.

Claim 17 becomes claim 6, dependent on claim 1.

Claim 18 becomes claim 7, dependent on claim 1.

Claim 19 becomes claim 8, dependent on claim 7.

Claim 20 becomes claim 9, dependent on claim 8.

Claim 21 becomes claim 10, dependent on claim 1.

Claim 22 becomes claim 11, dependent on claim 1.

Claim 26 becomes claim 12, dependent on claim 1.

Claim 25 becomes claim 13.

### ***Reasons for Allowance***

6. The following is an examiner's statement of reasons for allowance:

The present claims are allowable over the closest uncovered prior art, namely, **Mariotti et al** (IT 1,317,261), **Nakagawa et al** (US 2004/0143061), **Himes et al** (US 4,880,878), **Leicht** (US 4,764,535), and **Burnell** (US 5,272,182).

7. **Mariotti et al** discloses a foamed thermoplastic elastomeric material comprising: a mixture of 50 phr of high molecular weight styrene-butadiene-styrene block copolymer; and 50 phr of a medium molecular weight thermoplastic elastomer comprising styrene/ethylene/butylene/styrene or styrene-butadiene-styrene block copolymer (p. 4, lines 21-25; p. 5, lines 1-4); 40-80 phr (Tables 2-3) of a polypropylene

homopolymer comprising a commercially available isotactic crystalline polypropylene Moplen C30G (p. 5, lines 5-14) having the following characteristics T<sub>m</sub> of 166.9°C; MFI of 6 g/10 min; 50 phr of paraffin oil and endothermic foaming agents comprising a mixture of sodium bicarbonate and citric acid and azodicarbonamide blowing agent (p. 5, lines 20-24). However, **Mariotti et al** fails to specify the molecular weights and amounts of styrene blocks in the block copolymers and molecular weights of high molecular weight and medium molecular weight copolymers, as claimed in the instant invention.

**8. Nakagawa et al** discloses a thermoplastic resin composition comprising:

A) a low molecular weight hydrogenated block copolymer ABA having a number average molecular weight of less than 120,000;

B) of a high molecular weight hydrogenated block copolymer ABA, having a number average molecular weight of 120,000 or more, preferably 170,000-300,000 ([0081], [0092]); wherein the ratio between block copolymer A) and block copolymer B) is 95/5 to 5/95 ([0084]); a polyphenylene ether ([0015]); a paraffin oil ([0099]).

However, **Nakagawa et al** does not disclose the presence of a linear crystalline propylene copolymer, but rather discloses the composition comprising polyamide and polyphenylene ether as major components.

**9. Leicht** discloses an elastomer composition which may be subject to a foamed extrusion procedure (col. 3, lines 35-40) comprising a mixture of block copolymers

commercially available under a trademark of Kraton (col. 4, lines 50-63), a plasticizing oil (col. 3, lines 52-55) in combination with 0.25-5%wt of a nucleating agent (col. 5, lines 53-65) and blowing agents (col. 12, lines 55-56), but does not disclose the molecular weights and amounts of styrene blocks in the block copolymers and molecular weights of high molecular weight and medium molecular weight copolymers, as claimed in the instant invention.

**10. Burnell** discloses a composition comprising a triblock styrene-diene-styrene copolymer, extending oil, and 0.1-3%wt of a blowing agent comprising sodium bicarbonate-acid combination and nucleating agents (col. 8, lines 38-55; col. 5, lines 35-40), however, does not specify the molecular weights and amounts of styrene blocks in the block copolymers and molecular weights of high molecular weight and medium molecular weight copolymers, as claimed in the instant invention.

**11. Himes et al** discloses a thermoplastic blend comprising two block copolymers:  
A) 80-20 pbw of elastomeric block copolymer of the formula ABA, wherein the block A comprises a styrene polymer having an average molecular weight of between 4,000-115,000 contained in amount of 5-35%wt and a B block comprising butadiene with an average molecular weight of 20,000-450,000;  
B) 20-80 pbw of a block copolymer of the formula ABA, wherein each A block is monoalkenyl aromatic hydrocarbon having an average molecular weight of between

4,000-115,000, preferably 4,000-35,000 (col. 3, lines 30-35); contained in amount of 5-35%wt; B block is a hydrogenated (col. 2, lines 37-38) butadiene having an average molecular weight of between 20,000-450,000;

C) 50 phr of polypropylene (Table 2, col. 6, lines 63-64);

D) 125 phr of paraffinic oil (col. 6, lines 65-66; col. 7, line 9).

However, **Himes et al** does not specify the composition as being a foamable and does not explicitly teach the composition having the high molecular weight block copolymer as being the major component, wherein the low molecular weight block copolymer is present as minor component.

12. At the same time, the instant invention has shown that the presence of the high molecular weight block copolymer having molecular weight of 250,000 to 600,000 g/mol as the major component and within the ranges as claimed in the instant invention, and the low molecular weight block copolymer having molecular weight of 50,000 to 180,000 g/mol as the minor component, i.e. within the ranges as claimed in the instant invention, further in the presence of 42-80 pbw of linear propylene-based polymer having a polydispersity of more than 4.5, are critical for obtaining the composition having optimal combination of physical properties such as compression set and hardness. Thus, it has been shown that the composition having no low molecular weight block copolymer (composition H) provides foam having no skin (Table 4); the composition having low molecular weight block copolymer as the major component provides composition having too high values of compression set (Table 2); the presence of polypropylene in amounts

lower or higher than the claimed range provided compositions either having insufficient density reduction or that are too hard ([0087] of instant specification). Therefore, the claimed composition having the specific combination of high molecular weight block copolymer, low molecular weight block copolymer and polypropylene having polydispersity index of at least 4.5, used in the ranges as those claimed in the instant invention, shows an unexpected combination of properties such compression set, hardness and formation of skinned foam.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IRINA KRYLOVA whose telephone number is (571)270-7349. The examiner can normally be reached on Monday-Friday 8:00am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasudevan Jagannathan can be reached on (571)272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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